

It should be clearly understood that strong damping by *friction* is fundamentally undesirable, since *all* small waves are lost altogether, and large motions are only slightly controlled by the friction. Strong damping, even if of a nature that satisfies the equation given above, is still undesirable, because small *slow* waves are likely to be lost altogether, and larger slow ones are not sufficiently magnified. Nevertheless, when the damping is of this sort, and its magnitude  $\epsilon$  in the equation is known, we can compute under certain favorable conditions the actual magnitude of the ground movements. Finally, when friction and damping are both quite small, the instrument is highly sensitive to all minute disturbances, especially motions of nearly its own period. Such motions, however, are likely to be recorded on a greatly exaggerated scale. In general, the deductions and conclusions from a record made on a frictionless instrument of moderate period only slightly damped must be very carefully drawn. The steady mass in these cases acquires certain of the properties of "sensitive masses" previously mentioned.

Galitzin has greatly developed and employed electro-magnetic devices for damping, and for this purpose attaches to the steady mass one or more heavy copper plates, which are free to move between the poles of an electro-magnet. When the magnet is energized, movements of the steady mass are more or less strongly damped by the generation of electric currents in the copper plates. By a suitable disposition of this apparatus the same investigator causes the electric currents thus generated to record photographically the character of the motion. As the *velocity* of the relative motion of the ground and the steady mass, not the *displacement*, is shown by the electric recorder, it seems the data furnished by such records are not in the most convenient form.

The work of the present writer has thus far been directed very largely to the best methods of constructing the seismograph so as to secure what he has called earthquake-proof construction, universality, the longest practicable periods, etc., thereby reducing the necessity for damping to a minimum. It is intended, however, later on to investigate fully the effect of different forms and degrees of damping on actual instruments of the new design.

From a superficial examination of various actual records and effects from ordinary instruments, I find the damping often differs very widely in character from that represented by the logarithmic equation given above, and can not be represented by a simple exponent  $\epsilon$ , such as is often employed in the reduction of observations. The subject is one requiring very careful attention.

#### PUBLICATION OF CLIMATOLOGICAL DATA FROM COOPERATIVE OBSERVERS.

It is anticipated that beginning with the issue of January, 1908, Table II and Table III will be omitted from the MONTHLY WEATHER REVIEW.

Those desiring the data hitherto published in Table II for any State or Territory, or group of States, or for the whole country, may obtain them in the monthly reports of the appropriate section or sections of the Climatological Service of the Weather Bureau. Application for such reports may be addressed to "Chief U. S. Weather Bureau, Washington, D. C., for the Climatological Division", or to the officials in charge at the proper section centers.

### THE WEATHER OF THE MONTH.

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#### PRESSURE.

The distribution of mean atmospheric pressure for November, 1907, over the United States and Canada, is graphically shown on Chart VI, and the average values and departures from the normal are shown for each station in Tables I and V.

From October to November there is normally a substantial increase in the sea-level pressure over practically all portions of the United States and Canada, the increase being greatest over the interior districts, owing to the more rapid cooling of the continental area than of the districts near the seacoasts.

The increase in pressure during November over that for October, 1907, was more than twice the average over the central portions of the Plateau district, while over the Lake region, Ohio Valley, and middle Atlantic coast districts there was a pronounced decrease in the mean pressure as compared with the preceding month.

Over practically all districts in the United States from the Lake region and Ohio and lower Mississippi valleys westward to the Pacific the monthly mean pressure exceeded the normal, attaining the maximum over the central Rocky Mountain and Plateau districts, where an average pressure of more than 30.20 inches was maintained. Pressure was also comparatively high over the extreme eastern Canadian Provinces and over the lower Colorado Valley and the surrounding districts of Arizona and California. Over portions of the Lake region and the Atlantic coast districts from New England to Florida there was a small deficiency in pressure. Pressure was also below normal over the Canadian Northwest Territories, where at Edmonton the lowest mean pressure for the month, 29.90 inches, was maintained.

The distribution of pressure was such as to give a decided preponderance of northerly surface winds over the Atlantic and Gulf States, while along the northern border from North Dakota westward southerly winds modified the weather and ex-

tended their influence far to the northward over the Canadian Northwest Provinces.

The eastward movements of the areas of high and low pressure across the country were along paths generally south of the normal course, and large portions of the upper Mississippi and Missouri valleys and the slope region were not under the influence of any decided storm movement during the month. As a result of the southward trend of the storm tracks, the wind movement along the Gulf and Atlantic coasts was in excess of the normal, while over the districts from the middle Mississippi Valley westward there was a general diminution of wind movement, which was especially pronounced over the southern slope, where the velocities of the wind ranged from 10 to 40 per cent less than the average.

#### TEMPERATURE.

The unusual congestion of areas of high and low pressure over the Gulf States and the preponderance of northerly winds, with an excess of cloud and rain, brought unseasonably cold weather over the greater part of Texas and the southern portions of the cotton-growing States. Temperature was also below the normal over the lower Lake region, the Ohio Valley, and the Atlantic coast States from Florida to southern New England. Over the upper Lakes, the upper Mississippi and Missouri valleys, the districts west of the Rocky Mountains, and the Canadian Northwest Territories the average temperature for the month was uniformly above the normal.

Over the States from Minnesota westward to Idaho and in the adjoining Canadian Provinces the average temperature ranged from 6° to 10° above the normal. No severe cold was experienced and outdoor occupations were pursued thruout the month without interruption. Temperature was also somewhat above the normal over central New England and Florida, and it was unusually warm over portions of southern California. Maximum temperatures between 80° and 90° oc-

curred over Florida, the immediate Gulf coast, and the southern portions of Arizona and California, while over the Lake region and New England they ranged from 50° to 60°, and at a few points were slightly less than 50°. Temperatures below zero were confined to the portion of North Dakota east of the Missouri River and the adjoining portions of Minnesota and to points in the higher levels of the mountain regions of Wyoming and Colorado.

While no severe cold waves overspread the northern districts, unusually cold weather penetrated the Gulf States about the middle of the month, and temperatures of 32° or lower were recorded to the coast line and into northern Florida. No frosts occurred over the southern portion of Arizona, the lower levels of California, or along the coasts of Oregon and Washington.

#### PRECIPITATION.

Heavy rainfall, from 6 to 10 inches, occurred over eastern and central Texas, central and southern Arkansas and western Louisiana, also over a narrow area from southern Mississippi thru central Alabama to northwestern Georgia.

Amounts slightly above 6 inches were general along the Atlantic coast from Chesapeake Bay to southern New England, and from 6 to 10 inches along the coast districts of Oregon and Washington. Over the western slopes of the Coast and Cascade ranges in those States the fall was heavy, ranging from 10 to 25 inches at exposed points.

Precipitation was from 4 to 6 inches above the normal over the central parts of Texas, Arkansas, and Alabama, and generally more than 2 inches above over all districts from Texas northeastward over the cotton region States, Tennessee, the Middle Atlantic States, and New England. Along the immediate Atlantic coast from Virginia southward, including the Florida Peninsula, precipitation was below the normal, and a general deficiency prevailed over the Lake region, the Ohio Valley, and all districts west of the Mississippi Valley, except over the greater part of Texas and at points on the western slopes of the Coast and Cascade ranges of Washington and Oregon. Over a large portion of California and western Washington the deficiency amounted to from 2 to 3 inches.

Thruout the entire mountain and Plateau districts, the Great Plains from the Texas panhandle northward to Canada, and the upper Mississippi Valley, the amounts of precipitation for the month were generally less than one inch and occurred mostly in the form of light showers.

In California the progress of the rainy season, the opening of which occurred unusually early in October, was temporarily suspended during November, and in portions of the State it was the driest month of its name in many years.

The lack of moisture over the Florida Peninsula noted in the previous month continued till near the end of November, when general rains relieved the droughty conditions.

Generous and well-distributed amounts of precipitation occurred over the Gulf States, Appalachian Mountain districts, and New England, and rain was almost continuous during the latter half of the month over the western portions of Oregon and Washington.

#### SNOWFALL.

Snow, in small amounts generally, occurred over nearly all portions of the United States, the exceptions being the Atlantic coast districts south of Virginia, the greater part of the Gulf States, the lower elevations of New Mexico, Arizona, and California, and the western portions of Oregon and Washington. Depths of 12 inches or more occurred in the White and Adirondack and in the higher elevations of the Appalachian mountains, over upper Michigan and along the western slopes of the Main Divide from Idaho to New Mexico. There was also considerable snow in the mountains of Oregon, but over the greater part of the Mountain and Plateau districts, the Great Plains, central valleys, and Lake region, the total fall for the month was generally less than 1 inch.

At the end of the month the high western slopes of the mountains of northern Idaho were covered to depths of several feet, and there was considerable snow in the interior of New England, in the mountainous portions of northern New York, and over the upper Lake region; elsewhere but little snow remained on the ground.

#### HUMIDITY AND SUNSHINE.

The relative amount of moisture in the atmosphere was decidedly less than the average over the entire Mississippi and Missouri valleys, the north Pacific coast, and at points on the Atlantic coast.

Over the central and southern Plateau and Rocky Mountain districts and in western Texas the relative humidity, as in October and the preceding months of the year, was far above the average. Over western Texas, New Mexico, Arizona, Nevada, and portions of California, Colorado, and Utah, it ranged from 10 to 25 per cent above the normal.

Cloudy weather was general from the Lake region and Ohio Valley eastward over the Middle Atlantic and New England States, over the greater part of Texas and the western portions of Oregon and Washington, where the amount of clouds ranged from 70 to 80 per cent of the possible.

Over the middle Mississippi and Missouri valleys, the slope, mountain, and Plateau districts, there was a uniform absence of clouds and the amount of sunshine ranged from 60 to 80 per cent of the possible.

As a whole, November, 1907, was a cold, disagreeable month over the Gulf and portions of the Atlantic coast districts; but over the States of the corn belt and nearly all portions of the mountain, Plateau, and central and southern Pacific coast districts the weather was uniformly warm and dry, with an abundance of sunshine.

#### WEATHER IN ALASKA.

A severe cold wave for the season overspread the upper Yukon and the Copper River plateau during the first week of the month, with minimum temperatures from 30° to 40° below zero.

During the period from the 10th to the 20th mild and generally fair weather prevailed, but from the latter date to the end of the month cold weather again prevailed, the minimum temperatures ranging from 15° to 35° below zero and the maximum from zero to 15° below.

Over the southeastern and southern districts the weather continued mild, with about the normal amount of precipitation and the usual number of cloudy days. But little snow appears to have fallen in the interior districts, and the depth on ground had probably increased but little over that at the end of the preceding month.

*Average temperatures and departures from the normal.*

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
New England .....	12	40.2	+ 0.6	-23.0	- 2.1
Middle Atlantic .....	16	44.2	- 0.2	-15.8	- 1.4
South Atlantic .....	10	53.5	- 0.6	+ 4.8	+ 0.4
Florida Peninsula* .....	8	67.5	+ 1.1	+12.6	+ 1.1
East Gulf .....	11	54.2	- 1.5	+14.6	+ 1.3
West Gulf .....	10	53.8	- 2.1	+18.3	+ 1.7
Ohio Valley and Tennessee .....	13	44.0	- 1.2	- 6.5	- 0.6
Lower Lake .....	10	38.5	- 0.4	-22.5	- 2.0
Upper Lake .....	12	35.1	+ 1.0	-14.6	- 1.3
North Dakota* .....	9	30.0	+ 6.1	-19.7	- 1.8
Upper Mississippi Valley .....	15	39.0	+ 1.2	- 9.0	- 0.8
Missouri Valley .....	12	40.0	+ 2.6	+ 0.2	0.0
Northern Slope .....	9	35.1	+ 3.4	- 4.1	- 0.4
Middle Slope .....	6	42.4	+ 0.6	+12.1	+ 1.1
Southern Slope* .....	7	48.0	- 2.0	+17.2	+ 1.6
Southern Plateau* .....	12	47.4	- 0.2	+ 0.7	+ 0.1
Middle Plateau* .....	10	37.4	+ 0.1	+10.2	+ 0.9
Northern Plateau* .....	12	39.9	+ 3.2	+ 0.2	0.0
North Pacific .....	7	47.7	+ 2.6	+ 0.9	+ 0.1
Middle Pacific .....	8	54.6	+ 1.0	- 1.0	- 0.1
South Pacific .....	4	59.6	+ 2.6	+ 7.2	+ 0.7

\* Regular Weather Bureau and selected cooperative stations.

*In Canada.*—Director R. F. Stupart says :

The mean temperature of November was higher than the average thruout the Western Provinces and in British Columbia, the widest departure, about 10°, occurring in Alberta and Saskatchewan. In Ontario the departure was very generally negative by 1° or 2°, while in Quebec and the Maritime Provinces the mean of the month ranged from just average to 2° above. From Ontario to the Maritime Provinces there were but two fairly pronounced cool periods, namely, from the 12th to the 16th, and again during the last few days of the month.

*Average precipitation and departures from the normal.*

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		Inches.	Inches.
New England.....	12	4.79	133	+1.2	-1.9
Middle Atlantic.....	16	4.31	153	+1.5	-1.8
South Atlantic.....	10	3.23	114	+0.4	-11.0
Florida Peninsula*.....	8	1.51	68	-0.7	-9.5
East Gulf.....	11	5.76	162	+2.2	-1.5
West Gulf.....	10	6.24	181	+2.8	-5.2
Ohio Valley and Tennessee.....	13	3.26	94	-0.2	-2.3
Lower Lake.....	10	2.12	70	-0.9	-1.7
Upper Lake.....	12	1.74	71	-0.7	-2.6
North Dakota*.....	9	0.11	14	-0.7	-1.9
Upper Mississippi Valley.....	15	1.52	72	-0.6	+1.4
Missouri Valley.....	12	0.70	58	-0.5	+2.9
Northern Slope.....	9	0.36	42	-0.5	+0.4
Middle Slope.....	6	0.42	46	-0.5	-1.7
Southern Slope*.....	7	1.45	94	-0.1	-0.5
Southern Plateau*.....	12	0.32	44	-0.4	+3.4
Middle Plateau*.....	10	0.29	33	-0.6	+1.6
Northern Plateau*.....	12	1.01	68	-0.6	+1.0
North Pacific.....	7	6.07	85	-1.2	-11.1
Middle Pacific.....	8	0.46	16	-2.5	+0.3
South Pacific.....	4	0.02	2	-1.2	+1.3

\* Regular Weather Bureau and selected cooperative stations.

*In Canada.*—Director Stupart says:

The precipitation was heavy over the lower mainland of British Columbia and comparatively light on the upper mainland; 13.4 inches were recorded at Vancouver, 8.4 inches at Agassiz, and but 0.6 inch at Kamloops. In the Western Provinces it was almost nil, ranging from just a few snow flurries in Alberta to an aggregate of 0.15 inch of rain and about 4 inches of snow in Manitoba. Over the greater portion of Ontario the precipitation was part rain and part snow, but chiefly the former. It was generally in excess of the average, except near the shore lines of the lakes, where there was a small deficiency. In Quebec and the Maritime Provinces departures from the average amount were not pronounced, except in Prince Edward Island, where the quantity recorded was much below the average and decidedly less than in New Brunswick and Nova Scotia.

At the close of the month there was a light covering of snow over the whole of Quebec and over the larger portion of Ontario, while in parts of this latter province east and north of the Georgian Bay as much as 12 inches was reported. In northern New Brunswick there was also a light covering, but farther south and including Prince Edward Island and Nova Scotia there was but a trace here and there. In Manitoba there was from half an inch to 2 inches, but farther west all the prairie lands were quite bare, as were also the lower levels in British Columbia.

*Average relative humidity and departures from the normal.*

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England.....	77	-1	Missouri Valley.....	63	-8
Middle Atlantic.....	77	+2	Northern Slope.....	68	+1
South Atlantic.....	78	0	Middle Slope.....	65	+3
Florida Peninsula.....	80	0	Southern Slope.....	78	+14
East Gulf.....	73	-3	Southern Plateau.....	61	+16
West Gulf.....	73	-1	Middle Plateau.....	62	+8
Ohio Valley and Tennessee.....	72	-1	Northern Plateau.....	69	-3
Lower Lake.....	78	+1	North Pacific.....	87	+3
Upper Lake.....	77	-3	Middle Pacific.....	70	-2
North Dakota.....	76	-3	South Pacific.....	66	-1
Upper Mississippi Valley.....	72	-2			

*Average cloudiness and departures from the normal.*

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England.....	6.6	+1.0	Missouri Valley.....	4.0	-0.9
Middle Atlantic.....	6.3	+1.1	Northern Slope.....	4.2	-0.4
South Atlantic.....	5.4	+0.9	Middle Slope.....	3.4	+0.2
Florida Peninsula.....	4.4	-0.2	Southern Slope.....	5.8	+2.1
East Gulf.....	5.4	+0.9	Southern Plateau.....	2.9	+0.7
West Gulf.....	5.1	+0.5	Middle Plateau.....	3.2	-0.2
Ohio Valley and Tennessee.....	5.1	0.0	Northern Plateau.....	5.3	-0.5
Lower Lake.....	7.3	+0.1	North Pacific.....	7.1	-0.6
Upper Lake.....	6.7	-0.3	Middle Pacific.....	4.1	+0.1
North Dakota.....	4.9	-0.4	South Pacific.....	2.4	-0.8
Upper Mississippi Valley.....	4.3	-1.0			

*Maximum wind velocities.*

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Atlanta, Ga.....	6	50	nw.	Nantucket, Mass.....	6	68	e.
Block Island, R. I.....	6	64	ne.	Do.....	7	50	sw.
Do.....	7	51	w.	Do.....	24	56	ne.
Do.....	24	70	ne.	Do.....	25	55	ne.
Do.....	25	64	ne.	New York, N. Y.....	14	52	nw.
Buffalo, N. Y.....	13	60	sw.	North Head, Wash.....	1	60	se.
Do.....	21	51	s.	Do.....	18	60	se.
Do.....	23	50	w.	Do.....	19	68	se.
Chicago, Ill.....	20	52	sw.	Do.....	20	60	s.
Cleveland, Ohio.....	6	52	nw.	Do.....	21	52	s.
Concord, N. H.....	6	50	ne.	Do.....	23	64	s.
Detroit, Mich.....	21	50	sw.	Do.....	25	74	s.
Eastport, Me.....	3	50	s.	Do.....	28	62	se.
Do.....	6	58	e.	Point Reyes Light, Cal.....	13	64	nw.
Do.....	7	60	e.	Do.....	16	70	nw.
Do.....	25	54	e.	Do.....	17	69	nw.
Erie, Pa.....	20	55	se.	Do.....	19	50	nw.
Hatteras, N. C.....	6	58	w.	Do.....	23	51	s.
Do.....	7	50	nw.	Seattle, Wash.....	17	55	nw.
Mount Tamalpais, Cal.....	13	52	nw.	Southeast Farallon, Cal.....	1	60	s.
Do.....	17	51	n.	Tatoosh Island, Wash.....	2	56	sw.
Do.....	18	53	n.	Do.....	3	60	s.
Do.....	19	58	nw.	Do.....	4	60	s.
Do.....	20	52	nw.	Do.....	8	54	e.
Do.....	25	50	nw.	Do.....	9	54	e.
Mount Weather, Va.....	3	52	nw.	Do.....	18	60	s.
Do.....	6	57	w.	Do.....	21	60	s.
Do.....	7	64	w.	Do.....	23	53	sw.
Do.....	26	58	nw.	Do.....	25	72	s.
Do.....	27	56	nw.	Do.....	28	64	s.
				Toledo, Ohio.....	21	53	s.